PUUxx
Pump Unit

User Operation Manual

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Safety Notes

It is important that the unit is installed and operated in such a way that all applicable Health and Safety Requirements are met. It is the user's responsibility to ensure that all relevant Health and Safety Regulations are identified and complied with. Failure to do so may result in damage to the equipment and could cause personal injury.

In particular, the user should study the contents of this guide carefully before handling or operating this equipment. Under no circumstances will the supplier of this equipment be liable for any incidental, consequential or any special damages of any kind whatsoever, including but not limited to lost profits arising from, or in any way connected with the use of this equipment or this instruction manual.

Warnings:

- Always turn the unit off and unplug the power cord from the unit prior to any maintenance or installation process.
- Do not operate this unit in an atmosphere containing explosive gases.
- Only the approved, supplied cables/connectors must be used with this unit.
- Do not touch or loosen any screws or parts other than those specifically designated in the instructions. Doing so could cause misalignment and possibly void the warranty.
- The unit should be installed and operated under proper laboratory conditions with suitable ventilation and necessary health and safety guidelines adhered to at all times. The use of solvents for cleaning the unit is not recommended.

M2-Automation accepts NO responsibility for the misuse of the Pump Unit (PUUxx).

Intended Use Statement

The module is intended for use as part of a liquid handling system. The module should be operated only as outlined in this manual. If the module is operated in a manner that is not consistent with this manual then the warranty must be voided.

2 Introduction

The PUUxx is a membrane pump driven liquid pump unit.

2.1 Features

The PUU incorporates the listed features:

- Adjustable throughput via a speed control dial
- Dual 24V power input, 2.1mm jack, 3 pin M8 standard
- Luer in- and out port
- LED operation indicator
- Optional pulsation damper; provides a smooth liquid output, reduces pressure ripple
- Different maxmimal flow rates, PUUxx A/B/C/D:

A	0.05 l/min
B	0.1 l/min
C	0.3 l/min
D	0.6 l/min

2.2 Applications

The pump unit (PUUxx) is made for:

- general liquid pumping.
- sourcing a wash station with fresh washing liquid.
- evacuating a wash station of contaminated liquids.
- generating a under/overpressure to atmosphere.

Hardware Overview

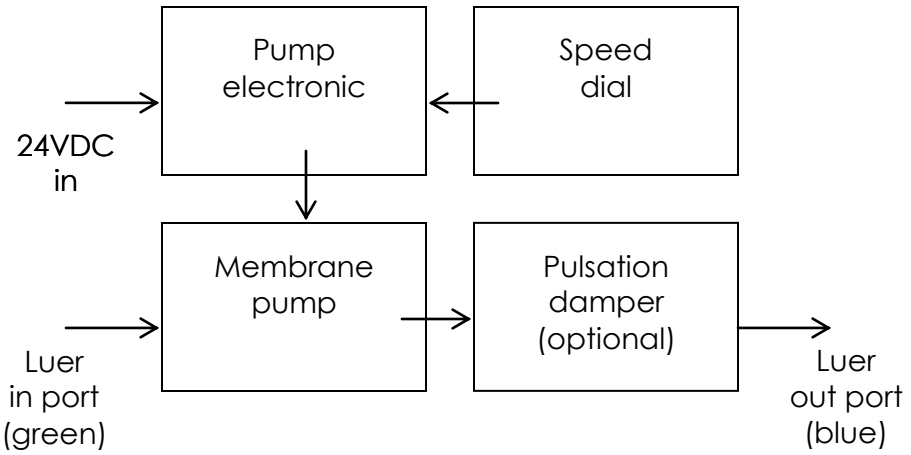


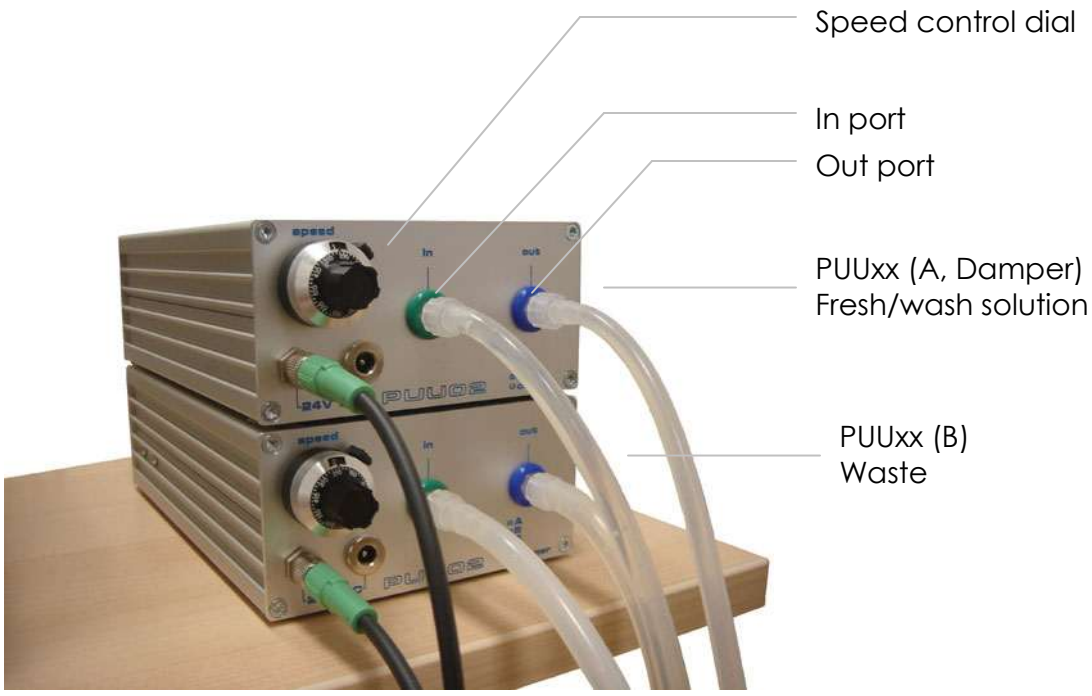
Figure 3-1 PUUxx connectivity overview

Pump Unit Set-up

4.1 Steps to set-up 2 pump units for a liquid handling wash station

1. Connect the fresh/wash solution pump unit (PUUxx) via the provided 3-pin connector cable to the SVC wash pump out port or direct to a 24VDC source via the 2.1mm jack.
2. Connect the waste pump unit (PUUxx) via the provided 3-pin connector cable to the SVC wash pump out port or direct to a 24VDC source via the 2.1mm jack.
3. Connect the wash station IN port (connected to the wash nozzle, bottom in the image below) to the OUT port of the fresh/wash solution pump unit (PUUxx (mark on the back of the unit: A, Damper). This is done by using the provided soft tubing with the attached Luer connectors. Then connect the IN port of the pump unit with the wash solution bottle.
4. Connect the wash station OUT port (waste basin, top in the image below) to the IN port of the waste pump unit (PUUxx (mark on the back of the unit: B)). Then connect the OUT port of the pump unit with the waste bottle.

Both the pump unit for fresh/wash solution and the pump unit for waste provide a speed control dial on the back of the unit. Tune the speed to a level that ensures the waste pump is running on a higher throughput than the fresh/wash solution pump unit. To do so avoids accidental flooding of the system.



Note:
Make sure that the waste pump unit has a higher liquid throughput than the fresh/wash solution pump unit. This can be achieved by tuning the speed of the pump units or by choosing a pump unit with a different throughput. E.g. PUU02 A and PUU02 B (B is indicating a higher throughput than A)

Specifications

For ease of reference, specifications have been categorized as listed below:

- Physical space requirements
- Electrical requirements
- Environmental requirements
- Chemical compatibility

5.1 Physical space requirements

Unit dimensions:

Height 55 mm
Length 165 mm
Depth 100 mm

Approximate weight:

Net weight 800 g
Shipping weight 1,2 kg

5.2 Electrical requirements

The following table lists the electrical requirements needed for operation of the pump unit:

Feature	Requirement
Power supply	24 vdc external power adapter, standard European power supply (230V AC ± 10%, 50 – 60Hz)
Power consumption	max. 5W
Fuses	none

Table 5-1 Electrical requirements

5.3 Environmental requirements

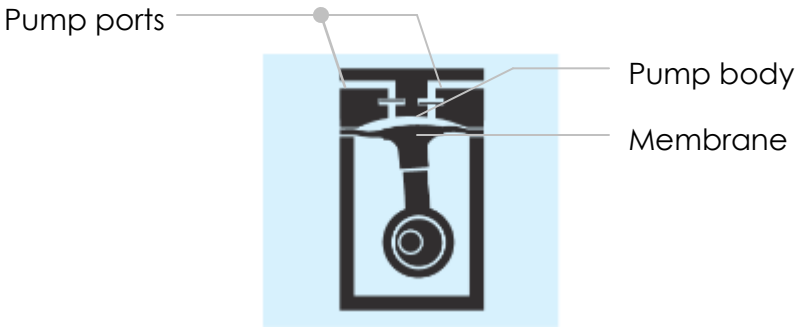
No specific environmental requirements are necessary for the operation of the unit; general laboratory conditions will suffice. However, for best results, the following items are recommended:

- Controlled operating temperature within the range 15 - 30°C
- Controlled relative humidity up to 85%

5.4 Chemical compatibility

5.4.1 Membrane pump and pulsation damper

All liquid that flows trough the membrane pump and the optional pulsation damper will have contact with EPDM (=Ethylene Propylene Diene Monomer; PP = Polypropylene and PTFE = Poly(tetrafluoroethylene). Membrane pumps with a different material mix are available on request.



5.4.2 Tubings

All liquid that flows trough the pump unit will have contact to the membrane pump and the optional pulsation damper (5.4.1 Membrane pump and pulsation damper) and the tubings that provide connection to the Luer in- and out ports. Standard tubing material for all pump units is silicon. To prove a safe and maintenance free operation of the pump unit please use the following section to select the right tubing material.

5.4.2.1 Tubing materials

Tygon® standard

Application: For standard applications

Features:

• Non-toxic, non-oxidizing
• Good resistance to acids, bases and inorganic media
• Very low gas permeability, good performance life

Material:

• Thermoplastic soft PVC, transparent
• Complies with the standards: FDA and GLP Conform
• Temperature range: -50 to +74 °C

Sterilization:

• Can be autoclaved for 30 min at 1 bar or sterilized by irradiation

Restriction:

• Segregation of plasticizers is possible

Use with:

• Acids: good

• Lyes: good
• Solvents: unsuitable
• Pressure: good
• Vacuum: good
• Viscous media: good
• Sterile media: conditional

Tygon® for food
Application: Food industry, well suited to products with high fat contents.
Features:
• Neutral to smell and taste
• Extremely smooth interior prevents bacterial growth
• Resistant to acids and bases
Material:
• Thermoplastic soft PVC, transparent
• Complies with the standards: FDA, 3-A, NSF
• Temperature range: -45 to +75 °C
Sterilization:
• Can be autoclaved
Restriction:
• Limited performance life
Use with:
• Acids: good
• Lyes: good
• Solvents: unsuitable
• Pressure: good
• Vacuum: good
• Viscous media: good
• Sterile media: conditional

Tygon® for hydrocarbons
Application: Especially for hydrocarbons, mineral oil products and distillates
Features:
• Ideal for petrol, kerosene, heating oil, cutting solutions and coolants on a glycol base
• Resistant to ozone and UV
Material:
• Thermoplastic soft PVC, translucent yellow
• Complies with the standards: GLP Conform
• Temperature range: -40 to +70 °C
Sterilization:
• Sterilization is not recommended
Restriction:
• Not suitable for concentrated acids, lyes, food and pharmaceutics
Use with:
• Acids: good

• Lyes: good
• Solvents: conditional
• Pressure: good
• Vacuum: good
• Viscous media: good
• Sterile media: conditional

PharMed®
Application: Ideal for medical, lab and research uses
Features:
• High fatigue strength under repeated reversed bending stresses
• Non-toxic, biocompatible
• Very low gas permeability
• Well suited to acids and bases
Material:
• Thermoplastic elastomer on a polypropylene basis with plasticizers; excellent tensile strength; opaque
• Complies with the standards: FDA (21 CFR 177.2600), USP 23 Class VI, GLP Conform
• Temperature range: -60 to +135 °C
Sterilization:
• Can be autoclaved with ethylene oxide or sterilized by irradiation
Restriction:
• Additives may migrate
Use with:
• Acids: good
• Lyes: good
• Solvents: unsuitable
• Pressure: good
• Vacuum: excellent
• Viscous media: good
• Sterile media: excellent

Silicone
Application: Platinum-coated silicone hose for use in pharmaceuticals and biology
Features:
• Extremely smooth interior prevents bacterial growth
• Biocompatible, minimal adsorption and absorption
• Best flow properties, high temperature stability
• Absolutely inert, softener-free
Material:
• Polydimethyl siloxane with siliceous earth and silicone additives; translucent white; excellent resistance to initial pressure
• Complies with the standards: USP Class VI, FDA, meets GLP and NSF
• Temperature range: -80 to +200 °C

Sterilization:
• Can be autoclaved for 30 min at 1 bar or sterilized by irradiation
Restriction:
• Not suitable for concentrated solvents, oils, acids or dilute caustic soda; relatively high permeability to gas
Use with:
• Acids: conditional
• Lyes: conditional
• Solvents: unsuitable
• Pressure: satisfactory
• Vacuum: good
• Viscous media: satisfactory
• Sterile media: excellent

Viton®
Application: Excellent acid resistance at high temperatures
Features:
• Low gas permeability
• Resistant to solvents and corrosives at high temperatures
Material:
• Fluorocarbon rubber, thermoformed Viton B (67% fluorinated); opaque black
• Complies with the standards: GLP Conform
• Temperature range: -30 to +205 °C
Sterilization:
• 16 hours at +250 °C with hot air circulation recommended
Restriction:
• Limited performance life
Use with:
• Acids: excellent
• Lyes: excellent
• Solvents: varies; tests recommended
• Pressure: good
• Vacuum: good
• Viscous media: good
• Sterile media: satisfactory

5.4.2.2 Tubing compatibility

	P	S	T	TU	V
A Acetaldehyde	D	C	D	D	D
Acetic acid, 10 % in W.	A	A	A	A	-
Acetic acid, 100 %	B	D	D	D	-
Acetic anhydride	A	A	D	D	D
Acetone	D	C	D	D	D
Acetonitrile	D	D	D	D	D
Acetyl bromide	C	D	D	D	-
Acetyl chloride	C	D	D	D	A
Aliphatic hydrocarbons	D	D	D	B	-
Aluminium chloride, 53 % in W.	A	A	A	A	A
Aluminium sulfate, 50 % in W.	A	A	A	A	A
Alums	A	A	A	A	-
Ammonia, gas and liquid	A	D	B	B	D
Ammonium acetate, 45 % in W.	A	A	A	A	-
Ammonium carbonate, 20 % in W.	A	A	A	A	-
Ammonium chloride	A	C	A	A	A
Ammonium hydroxide, 30 % in W.	A	D	A	C	A
Ammonium nitrate	A	C	A	A	-
Ammonium phosphate	A	A	A	A	-
Ammonium sulfate	A	A	A	A	A
Amyl acetate	B	D	D	D	D
Amyl alcohol	D	D	D	A	A
Amyl chloride	C	D	D	D	-
Aniline	C	D	D	D	-
Aniline hydrochloride	C	D	D	D	D
Aqua regia (80 % HCl, 20 % HNO_3)	D	D	D	D	-
Aromatic hydrocarbons	D	D	D	D	-
Arsenic salts	A	A	A	A	-
B Barium salts	A	A	A	A	-
Benzaldehyde	D	C	D	D	D
Benzene	D	D	D	D	-
Benzenesulfonic acid	D	D	D	D	A
Boric acid, 4 % in W.	A	A	A	A	A
Bromine	D	D	D	D	A
Butane	A	A	A	A	A
Butanol (butyl alcohol)	D	D	D	A	A
Butyl acetate	B	D	D	D	D
Butyric acid	B	D	D	C	-

Tubing:
P = PharMed®
S = Silicone
T = Tygon® standard and Tygon® food
TU = Tygon® hydrocarbon
V = Viton®

Resistance:
A = excellent
B = good
C = conditional
D = unsuitable
- = non tested

		P	S	T	TU	V
C	Calcium oxide	A	A	A	A	-
	Carbon bisulfide	D	D	D	D	-
	Carbon tetrachloride	D	D	D	D	A
	Chlorine, wet	D	D	B	B	B
	Chloracetic acid, 20 % in W.	B	A	A	D	D
	Chlorobenzene	D	D	D	D	A
	Chloroform	D	D	D	D	A
	Chrobromomethane	B	D	D	D	A
	Chromic acid, 20 % in W.	A	D	B	C	A
	Chromic acid, 50 % in W.	C	D	C	D	-
	Copper salts	A	A	A	A	-
	Cyclohexane	D	D	D	C	A
	Cyclohexanone	D	D	D	D	D
	Cyorosulfonic acid	D	D	D	D	D
D	Diesel	D	D	-	B	-
	Dimethyl formamide	B	A	D	D	D
E	Ethanol (ethyl alcohol)	A	B	D	B	A
	Ether	C	D	D	C	-
	Ethyl acetate	B	D	D	D	D
	Ethyl bromide	D	D	D	D	-
	Ethyl chloride	C	D	D	D	A
	Ethylamine	D	C	D	D	-
	Ethylene chlorhydrin	A	B	D	B	A
	Ethylene dichloride	C	D	D	D	B
	Ethylene glycol	A	A	A	A	A
	Ethylene oxide	A	A	A	A	D
F	Ferric chloride 40 % in W.	A	A	A	A	B
	Ferric sulfate 5 % in W.	A	A	A	A	A
	Ferrous chloride 43 % in W.	A	A	A	A	-
	Ferrous sulfate 5 % in W.	A	A	A	A	-
	Fluoboric acid, 10 % in W.	D	D	A	A	-
	Fluoroborate salts	A	-	A	A	-
	Fluosilicic acid	C	B	D	B	-
	Formaldehyde, 37 % in W.	D	C	D	D	D
	Formic acid, 25 % in W.	A	A	A	C	D
	Freon 11	A	A	A	A	-
	Fruit juice	A	A	A	A	A
G	Gasoline, high-aromatic	D	D	D	B	A
	Gasoline, non-aromatic	D	D	D	B	A
	Glycerin	A	A	A	A	A

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		P	S	T	TU	V
H/I	Hydrobromic acid, 20 - 50 %	D	D	A	A	A
	Hydrochloric acid, 10 % in W.	A	A	A	A	A
	Hydrochloric acid, 37 % in W.	B	D	A	D	B
	Hydrocyanic acid	A	A	A	A	A
	Hydrofluoric acid, 10 % in W.	D	D	A	A	B
	Hydrofluoric acid, 50 %	D	D	B	D	A
	Hydrogen peroxide, 10 % in W.	A	A	A	A	A
	Hydrogen peroxide, 90 % in W.	B	C	D	D	-
	Hydroiodic acid	B	B	A	A	-
	Hypochlorous acid, 25 % in W	A	A	A	A	A
	Iodine solutions	A	C	A	A	-
K/L	Ketones	D	D	D	D	-
	Lactic acid, 10 % in W.	A	A	A	A	-
	Lactic acid, 85 % in W.	B	D	D	D	-
	Lead acetate, 35 % in W.	A	A	A	A	-
M	Maganese salts	A	A	A	A	-
	Magnesium chloride, 35 % in W.	A	A	A	A	A
	Magnesium sulfate, 25 % in W.	A	A	A	A	-
	Mercury salts	A	A	A	A	-
	Methane	A	-	A	A	A
	Methanol	A	B	D	B	D
	Methyl Ethyl Ketone	D	D	D	D	D
	Monoethanolamine	C	D	D	D	D
N	Naphtha	D	D	D	D	A
	Nickel salts	A	A	A	A	-
	Nitric acid, 10 % in W.	A	C	A	D	A
	Nitric acid, 35 % in W.	A	D	A	D	A
	Nitric acid, 68 - 71 % in W.	D	D	D	D	-
	Nitrobenzene	D	D	D	D	-
	Nitrous acid, 10 % in W.	A	B	A	C	-
O	Oils, animal	C	A	D	A	-
	Oils, mineral	D	D	C	A	A
	Oleic acid	C	B	D	B	B
P	Perchloric acid, 67 % in W.	A	D	C	D	A
	Perchlorethylene	C	D	D	D	A
	Phenol, 91 % in W.	A	B	D	C	-
	Phosphonic acid 25 % in W.	A	D	A	A	A
	Phthalic acid, 9 % in Alc.	A	B	D	C	-
	Potassium carbonate, 55 % in W.	A	A	A	A	-
	Potassium cyanide, 33 % in W.	A	A	A	A	-

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		P	S	T	TU	V
P	Potassium hydroxide, <10 % in W.	A	A	A	D	B
	Potassium iodide, 56 % in W.	A	A	A	A	-
	Propanol (propyl alcohol)	C	A	D	D	B
	Pyridine	C	D	D	D	D
S	Silicone oils	C	D	B	A	A
	Silver nitrate, 55 % in W.	A	A	A	A	A
	Soap solutions	B	A	A	A	A
	Sodium bicarbonate, 7 % in W.	A	A	A	A	A
	Sodium bisulfate	A	-	A	A	-
	Sodium borate	A	A	A	A	A
	Sodium carbonate	A	A	A	A	B
	Sodium ferrocyanide	A	A	A	D	-
	Sodium hydrosulfite	A	-	A	A	-
	Sodium hydroxide, 10 - 15 % in W.	A	A	A	D	B
	Sodium hydroxide, 30 - 40 % in W.	A	C	A	D	B
	Sodium nitrate, 3.5 % in W.	A	A	A	A	-
	Sodium sulfate, 3.6 % in W.	A	A	A	A	A
	Sodium sulfide, 13 % in W.	A	A	A	A	-
	Stearic acid, 5 % in Alc.	C	D	D	B	-
	Sulfuric acid, 10 % in W.	A	A	A	B	A
	Sulfuric acid, 30 % in W.	A	B	A	B	A
	Sulfuric acid, 95 - 98 % in W.	D	D	D	D	A
	Sulfurous acid	A	A	A	A	A
T	Tannic acid, 75 % in W.	B	A	B	D	-
	Tartaric acid, 56 % in W.	A	A	A	A	A
	Tin salts	A	A	A	A	-
	Toluene (toluol)	D	D	D	D	A
	Trichloroacetic acid, 90 % in W.	B	A	A	D	C
	Trichlorethylene	C	D	D	D	A
	Trisodium phosphate	A	A	A	A	A
	Turpentine	D	D	D	B	A
	Urea, 20 % in W.	A	A	A	A	-
	Uric acid	A	A	A	C	-
W/Z	Xylene	D	D	D	D	B
	Zinc chloride, 80 % in W.	A	A	A	A	A

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Contact details

For further assistance or questions regarding the pump unit (PUUxx), please contact us, or visit our website at:

www.m2-automation.de

Technical support is available via email (info@m2-automation.de), alternatively contact us and speak to technical support personally.

M2-Automation

info@m2-automation.de (information)

Important information

Warranty

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